REMARKS

No amendments to the claims have been made.

Claims 1-26 are pending. Claims 1 and 15 are the independent claims. Independent claim 15 is identical to claim 1, except that it recites that the interferometric measuring of the information is done "using a single-wavelength interferometer."

All claims stand rejected as allegedly obvious over U.S. Patent No. 6,271,923 ("Hill(923)") in view of U.S. Patent Application No. 2001/0035959 ("Hill(959)"). Specifically, the action alleges that Hill(923) discloses "analyzing optical gradients caused by environmental effects produced by the photolithographic exposure cycle (col. 15, lines 13-60 and col. 46, lines 56 – col. 47, 19) and applying correction factors to subsequent interferometric measurements of the stage (col. 43, lines 8-44)." (Action at page 2.) It notes that "Hill(923) also discloses using a single-wavelength interferometer (14)." (Id.) It further alleges that "it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the method of analyzing position information indicative of local slope on a side of the stage of Hill(959) to the invention of Hill(923)." (Action at page 3.) We traverse.

First, the action's characterization of Hill(923) is incorrect.

While the cited section at col. 15, lines 13-60 (and the subsequent section referred to therein at col. 18, line 1, through col. 19, line 35) disclose the existence of the optical gradients, there is nothing in these sections that disclose "analyz[ing] the position information to determine correction factors indicative of ... optical gradients caused by environmental effects produced by the photolithographic exposure cycle," as recited in independent claims 1 and 15. To the contrary, the angular orientation θ of the measurement object mirror is simply expressed as the sum of a first term related to the phases actually measured by the system and a second term related to the optical gradients that is not characterized by the early embodiments disclosed in Hill(923). See, for example, Equation 8 at col. 18 of Hill(923).

Hill(923) does ultimately disclose a way to measure the second term; however, the measurement involves using two more wavelengths (i.e., dispersion interferometry). Hill(923) states:

> The angle and linear displacement calculations in the embodiments described above depend on the refractive index n_M of the gas in the measurement path. Changes in the refractive index, caused for example, by air turbulence along the measurement path, can therefore alter the angle and displacement measurements. To compensate for such effects any of the interferometry systems described above can involve measurement and reference beams that includes *at least two separate wavelength components*, e.g., dispersion interferometry. The reference and measurement beam components at each wavelength are combined with one another to form an overlapping pair of exit beams. Interferometric signals, e.g., phases ϕ_i, at each wavelength are then derived from the respective overlapping pair of exit beams. (Hill(923) at col. 42, lines 29-42, emphasis added.)

The section at col. 43, lines 8-44 cited by the action corresponds to further details regarding such dispersion interferometry. So, while it is true that Hill(923) discloses the use of a single-wavelength interferometer (e.g., to make the initial distance or angle measurement), that interferometer is not used to account for optical gradients – rather Hill(923) teaches that a multi-wavelength interferometer should be used if it is desired to also account for optical gradients caused by environmental effects.

Furthermore, even when such multi-wavelength measurements are made, they are not used to determine correction factors that are "appl[ied] ... to *subsequent* interferometric measurements of the stage," as recited in independent claims 1 and 15 (emphasis added). To the contrary, for each position measurement, Hill(923) measures the interferometric phase at two or more wavelengths. See, e.g., Equation 27 at col. 43. There is nothing about determining corrections factors for that measurement, and then applying those same correction factors to "subsequent interferometric measurements."

Moreover, there is nothing in Hill(923) that discloses that the corrections factors that are "appl[ied] ... to *subsequent* interferometric measurements of the stage" are not only indicative of "optical gradients caused by environmental effects produced by the photolithographic exposure cycle," but also "indicative of a local slope on a side of the stage used to reflect an

interferometric measurement beam," as recited in independent claims 1 and 15. Indeed, the action concedes as much. (Action at page 2.)

Accordingly, with respect to independent claims 1 and 15, Hill(923) fails to disclose: "analyzing the position information to determine *correction factors indicative of a local slope on a side of the stage used to reflect an interferometric measurement beam and optical gradients caused by environmental effects produced by the photolithographic exposure cycle*; and *applying the correction factors to subsequent interferometric measurements of the stage*," as recited in independent claims 1 and 15 (emphasis added).

Furthermore, with respect to independent claim 15, Hill(923) fails to disclose that the measured information used to determine the claimed correction factors is "a single-wavelength interferometer," as recited in independent claim 15. To the contrary, Hill(923) teaches the opposite – that optical gradient effects should be characterized by measurements at multiple wavelengths (i.e., dispersion interferometry.)

Hill(959) does not remedy what is missing from Hill(923).

While Hill(959) does disclose determining correction factors relating to the local slope of a stage mirror and applying such factors to subsequent measurements, there is no suggestion in either Hill(959) or Hill(923) that the corrections factors from Hill(959) should be determined from interferometric measurements made "during a photographic exposure cycle" or that they should also be "indicative of ... optical gradients caused by environmental effects produced by the photolithographic exposure cycle," as recited in claims 1 and 15.

To the contrary, and as noted in our prior Reply, Hill(959) explains that the position information for his mirror characterization is taken during a "calibration mode" (e.g., see Hill(959) at Paragraphs 43 and 44) and:

> "Once the mirrors have been characterized, error correction signals may be used when the apparatus is operated in a measurement mode to precisely position a wafer with respect to the reference frame and in turn with respect to the mask used to expose the wafer." (Hill(959) at Paragraph 71.)

In other words, the position information used to determine the mirror correction factors in Hill is taken before, not during, a photolithographic exposure cycle. Accordingly, the mirror correction

factors have nothing to do with "optical gradients caused by environmental effects produced by the photolithographic exposure cycle," as claimed.

We submit that the Action does not explain how or why one of ordinary skill in the art would adjust the dispersion measurements taken during the photolithographic exposure cycle in Hill(923) to include the mirror characterization correction factors taken during a calibration mode in Hill(959).

Even assuming, for the sake of argument only, that there is some motivation to combine Hill(923) and Hill(959), the only reasonable combination would be to calibrate the stage mirror imperfections as taught in Hill(959) (i.e., prior to any photolithographic exposure cycle), and to separately account for atmospheric turbulence during the photolithography exposure cycle using the multiple-wavelength dispersion technique described in Hill(923). But this is not what is claimed.

Rather, independent claims 1 and 15 require that the claimed correction factors are "indicative of a local slope on a side of the stage used to reflect an interferometric measurement beam *and* optical gradients caused by environmental effects produced by the photolithographic exposure cycle," that such correction factors are determined by analyzing interferometrically measured position information taken "during a photolithographic exposure cycle," and that the correction factors are then "appl[ied] to subsequent interferometric measurements of the stage."

To the extent the Examiner reasonably believes some other combination of Hill(923) and Hill(959) discloses such limitations, we respectively ask the Examiner to point to support in the cited prior art for how the respective techniques of Hill(923) and Hill(959) can be combined, why one of ordinary skill in the art would do so, and why that person would know how to do so. Otherwise, we ask the Examiner to withdraw the rejection of independent claims 1 and 15.

Furthermore, independent claim 15 also requires that the correction factors are determined by analyzing interferometrically measured position information taken "during a photolithographic exposure cycle *using a single-wavelength interferometer.*" In contrast, the action relies on Hill(923) to obtain the claimed optical gradient information information, and, as described above, Hill(923) only obtains such information by analyzing interferometric

measurements taken at *multiple* wavelengths. This is yet another reason why we ask the Examiner to withdraw the rejection of independent claim 15.

The remaining dependent claims are allowable for at least the same reasons as those for the independent claims from which they depend.

In view of the above, we ask that the application be allowed.

Canceled claims, if any, have been canceled without prejudice or disclaimer.

Any circumstance in which the applicant has (a) addressed certain comments of the examiner does not mean that the applicant concedes other comments of the examiner, (b) made arguments for the patentability of some claims does not mean that there are not other good reasons for patentability of those claims and other claims, or (c) amended or canceled a claim does not mean that the applicant concedes any of the examiner's positions with respect to that claim or other claims.

Enclosed is a check for the Petition for Extension of Time fee. Please apply any other charges or credits to deposit account 06-1050, referencing 09712-208001.

Respectfully submitted,

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